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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/04/2004

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SHA 131NP

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EXAMINER

ROLLAND, ALEX A

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/509,881	Applicant(s) ZHANG ET AL.	
	Examiner ALEX ROLLAND	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Dai et al (US 6,808,746).

Regarding claim 1, Hickel et al teaches a method of arranging fullerenes on a substrate wherein:

a substrate is made hydrophobic or hydrophilic (col. 2, lines 40-46);

fullerene and amphiphilic polymers are mixed and dissolved in a volatile organic solvent (col. 2, line 7 and col. 3, lines 35-50)

the solution is spread on the water surface, the organic solvent is vaporized, whereby a film remains on the water surface wherein the film is compressed (col. 3, lines 35-50); and

transferred onto the substrate (col. 3, lines 35-50).

Hickel et al does not explicitly state that pressure is applied by controlling the surface pressure-area isotherm. However, such a feature is believed to be inherent as Hickel et al discloses a surface pressure-area isotherm that is substantially identical the surface pressure-area isotherm in the present application (See Figure 1).

Hickel et al teaches the genus fullerene and not the species carbon nanotube (also known as a cylindrical fullerene). However, Dai et al teaches a method for making an aligned carbon nanotubes film (abstract) wherein the Langmuir-Blodgett technique is used to deposit carbon nanotube onto the substrate (col. 1, line 62-col.2, line 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the

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invention to practice the method of Hickel et al using carbon nanotubes as the fullerene material because Dai et al teaches that it is suitable to do so.

Regarding claim 5, Hickel et al is discussed above but does not specifically state the pressure in which the fullerene film is compressed. However, usage of pressure between 20-50 mN/m would have been obvious to one of ordinary skill in the art at the time of the invention to choose through process optimization, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

5. Claims 2-3 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Dai et al (US 6,808,746) in further view of Ligenza (US 2,930,722).

Hickel et al and Dai et al are discussed above and Hickel et al does disclose that the substrate can be hydrophobic or hydrophilic (col. 2, line 44) and a hydrophobic treatment for using silanes that must be used on a hydrophilic substrate, including silicon (col. 3, lines 4-10), but fails to disclose a specific hydrophilic treatment.

However, Ligenza teaches a method of hydrophilic treatment used in the treatment of silicon. This treatment involves immersion of silicon substrate into

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concentrated nitric acid at a temperature of about 100°C in order to make said substrate almost perfectly hydrophilic. See col. 2, lines 65-70 and col. 3, lines 5-12.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the well-known method disclosed in Ligenza in order to make hydrophilic a substrate for use in the process disclosed in Hickel et al and, if desired, further utilize the hydrophobic treatment taught by Hickel et al for using silanes that must be used on a hydrophilic substrate because Hickel et al teaches that the substrate may be hydrophobic or hydrophilic and the hydrophobic treatment taught by Hickel requires the substrate be first made hydrophilic.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Dai et al (US 6,808,746) in further view of Fujimaki et al (US 4,009,305).

Hickel et al and Dai et al are discussed above but does not disclose a specific method for attaching an organic macromolecule. However, Fujimaki et al teaches a method of oxidizing carbon fibre wherein:

nitric acid is utilized to form oxygen-containing functional groups such as carboxyl groups (col. 2, lines 40-60);

the functional groups on the surface of the carbon fibre are reacted with an organic amine (col. 2, lines 60-65) then mixed with polyacetal resin (col. 4, lines 25-26); and

the resulting carbon fibre has an affinity for most synthetic resins (col. 4, lines 3-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hickel et al to include oxidation followed by reaction with an amine as suggested by Fujimaki with a reasonable expectation of success since Hickel et al teaches a mixture of fullerene and organic polymeric amphiphilic compound and Fujimaki teaches that oxidation followed by reaction with an amine increases carbon fibre's affinity towards synthetic resin (an organic polymer that may be amphiphilic).

7. Claims 4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Dai et al (US 6,808,746) in further view of Fujimaki et al (US 4,009,305) and Bening et al (WO 90/14221).

Hickel et al, Dai et al, and Fujimake et al are discussed above but fail to teach sulfating as the specific method of oxidizing carbon nanotubes. However, Bening et al teaches a method for oxidizing carbon microfibers using a sulfuric acid solution (abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to add a step for oxidizing the carbon material to the method taught by Hickel et al and Fujimaki et al for the predictable result of further oxidizing the carbon material.

8. Claims 6-7, 11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Dai et al (US 6,808,746) in further view of Uekita et al (US 5,043,248).

Hickel et al and Dai et al are discussed above but does not specifically disclose a method for decomposing and evaporating amphiphilic organic macromolecule or the type of light irradiation used.

However, Uekita et al teaches photosensitive amphiphilic organic polymers useful in the Langmuir-Blodgett technique that have a structure of causing decomposition by ultraviolet rays. See col. 2, lines 1-15, generally.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hickel et al to include ultraviolet radiation to aid in the removal of amphiphilic organic polymers as suggested by Uekita et al with a reasonable expectation of success since Hickel et al teaches the Langmuir-Blodgett technique applied to fullerenes using amphiphilic organic molecules and Uekita et al teaches that ultraviolet radiation aids in the removal of amphiphilic organic molecules after the Langmuir-Blodgett technique is preformed.

9. Claims 8-9 and 12-13 are rejected over Hickel et al (US 5,580,612) and Dai et al (US 6,808,746) in view of Ligenza (US 2,930,722) as applied to claim 2 above, and further in view of Uekita et al (US 5,043,248) for the same reasons applied to claims 6-7 above.

10. Claims 10 and 14 are rejected over Hickel et al (US 5,580,612) and Dai et al (US 6,808,746) in view of Fujimaki et al (US 4,009,305) and Bening et al (WO 90/14221) as applied to claim 4 above, and further in view of Uekita et al (US 5,043,248) for the same reasons applied to claims 6-7 above.

Response to Arguments

11. Applicant's arguments filed 3/3/09 have been fully considered but they are not persuasive. Hickel clearly teaches chemically modifying the fullerenes by forming a mixture of fullerene and an amphiphilic compound resulting in a fullerene-containing amphiphilic molecule (col. 2, lines 5-32). Additionally, the mixture of the amphiphilic compound and the fullerene are dissolved in a volatile organic solvent (col. 3, lines 39-41). In this regard, Hickel does not teach away from the instant invention and additionally provides substantial evidence that the Hickel and the instance invention are closely related. Specifically, both are performing a LB method wherein water-insoluble molecules (**predominantly the amphiphilic substance**) are spread on the surface of a body of water.

Conclusion

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12. No Claims are allowed. All pending claims are rejected for the reasons set forth above.

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX ROLLAND whose telephone number is (571)270-5355. The examiner can normally be reached on Monday through Friday, 9:00 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEX ROLLAND/
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792